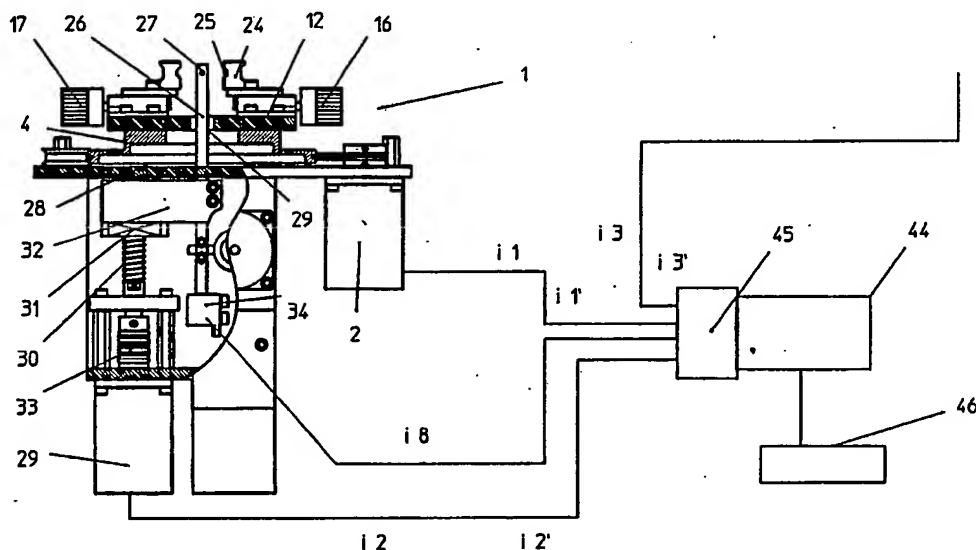




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁵ : B44B 3/00, 3/04, 3/06		A1	(11) International Publication Number: WO 93/04876
			(43) International Publication Date: 18 March 1993 (18.03.93)
(21) International Application Number: PCT/SE92/00625 (22) International Filing Date: 10 September 1992 (10.09.92) (30) Priority data: 9102640-1 12 September 1991 (12.09.91) SE (71) Applicant (for all designated States except US): AUTOEN- GRAVING AB [SE/SE]; Kougstagården, Häggenås, S- 830 30 Lit (SE). (72) Inventor; and (75) Inventor/Applicant (for US only): ANDERSSON, Morgan [SE/SE]; Kougstagården, S-830 30 Lit (SE). (74) Agent: KARLSSON, Berne; P.O. Box 2078, S-137 02 Väs- terhaninge (SE).		(81) Designated States: CA, JP, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, SE). Published With international search report.	

(54) Title: DEVICE RELATING TO AN ENGRAVING MACHINE



(57) Abstract

A computer-controlled engraving machine for objects in the form of rings, bracelets, medallions, etc., incorporates various types of securing elements to enable engraving by means of rotary movements in the elements supporting the object and longitudinal displacement movements and tilting movements in an engraving tool (26). A computer (44) is fed information on the required engraving and signals (i1, i2, i3) are generated in order to control the said rotary, longitudinal displacement and tilting movements. The longitudinal displacement function for the engraving tool is essentially play-free. Various types of objects are made possible. A rotary movements-effecting element includes a rotary movement-transforming element which transmits the rotary movement to a receiving element.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	FI	Finland	MN	Mongolia
AU	Australia	FR	France	MR	Mauritania
BB	Barbados	GA	Gabon	MW	Malawi
BE	Belgium	GB	United Kingdom	NL	Netherlands
BF	Burkina Faso	GN	Guinea	NO	Norway
BG	Bulgaria	GR	Greece	NZ	New Zealand
BJ	Benin	HU	Hungary	PL	Poland
BR	Brazil	IE	Ireland	PT	Portugal
CA	Canada	IT	Italy	RO	Romania
CF	Central African Republic	JP	Japan	RU	Russian Federation
CG	Congo	KP	Democratic People's Republic of Korea	SD	Sudan
CH	Switzerland	KR	Republic of Korea	SE	Sweden
CI	Côte d'Ivoire	LI	Liechtenstein	SK	Slovak Republic
CM	Cameroon	LK	Sri Lanka	SN	Senegal
CS	Czechoslovakia	LU	Luxembourg	SU	Soviet Union
CZ	Czech Republic	MC	Monaco	TD	Chad
DE	Germany	MG	Madagascar	TG	Togo
DK	Denmark	ML	Mali	UA	Ukraine
ES	Spain			US	United States of America

- 1 -

TITLE

Device relating to an engraving machine.

TECHNICAL FIELD

The present invention relates to a device relating to a computer-controlled engraving machine, in which an object can be fixed in securing elements, an engraving tool and the securing element are arranged to execute mutually relative movements for the realisation of the engraving function and units effecting the said relative movements are controllable from the computer installation. Engraving information is entered or can be entered into the computer installation via a terminal. With the aid of the information, control signals are generated for controlling the said movement-effecting units.

PRIOR ART

Through PCT-application W090/15723 of the same inventor, it is known to achieve a very high level of well-working automation for the engraving of annular objects. The proposed equipment specifies the principles for the engraving function which, in a very precise and well-defined manner, carries out the automation function. Information on engraving data, type style, symbols etc. is entered into the associated computer installation and the signal establishment is carried out in the installation so that electrical signals for controlling the movement-effecting units of the machine are obtained.

DESCRIPTION OF THE INVENTION

TECHNICAL PROBLEM

The proposed equipment is designed primarily for large-scale operation and indicates solutions for only

- 2 -

annular objects which are to be engraved on the inside.

There is a desire for engraving installations which can be utilised by smaller users also, requirements existing for a simplified structural design of the machine in question, which could at the same time be supplied at a lower price. The requirement that the machine should be able to operate flawlessly and effectively over long periods with a well-defined and selectable engraving function continues however to be uppermost.

The inventor of the machine, in producing the same, has realised that additional requirements could be placed upon the machine. A small user often needs to have the engraving function carried out not only on annular objects, but also on objects of a different type which are to be engraved. In this connection, it can be stated that there is a desire to be able to engrave also the outsides of objects in the form of signet-rings, bracelets etc. In addition, there is often a wish to be able to engrave surfaces, including flat surfaces, on disc-shaped items, medallions etc. Manufacturers of machines of this generic type also want to be able to supply a range of machinery offering various machine variants, e.g. a variant for annular items, one for bracelets etc. In this regard, the various machine variants should be able to be produced individually or with auxiliary fittings for a basic version of the machine, with which auxiliary fittings the different variants are produced in connection with a sale or are set up in connection with the engraving work. The basic machine and the auxiliary fittings would have to be constructed so that a change from one machine function to another remains technically simple to execute.

It is a complex technical challenge to be able to obtain the solution to all or part of the above set of problems.

- 3 -

SOLUTION

The present invention relates to a device which solves, inter alia, the abovementioned problems and what primarily, in this regard, can be considered to be characteristic of the invention is that one or more of the movement-effecting units comprise rotating and longitudinally displaceable parts, which operate in conjunction and with an essentially play-free functioning in the respective relative movement between the engraving tool and the securing element. The securing element can be arranged to receive irregular objects for securement, e.g. signet-rings, which are to be provided with engravings on the insides. A characterising feature of the invention is also that a unit effecting relative movements in the form of rotary movements between the engraving tool and the securing element is provided with or interacts with a rotary movement-transforming element, e.g. a first gearwheel, by means of which a said rotary movement-receiving element, e.g. a second gearwheel or a gear rack, is controllable in order, in turn, to realise other movements, e.g. other rotary movements or linear movements, for the securing element. In this way, the latter is capable of receiving objects whose form is related to the said transforming and receiving elements. The object can have the form of a disc, bracelet etc. which is to be provided with engraving on a lateral surface, outside etc.

In a preferred embodiment, the rotary movement-effecting unit is arranged to allow the engraving tool to extend in or through a centre-part in the rotary movement-effecting unit. In one embodiment, one and the same machine can be arranged for exchangeability or supplementation of the securing element, so that the machine can be alternatively arranged for engraving the inside of closed or open and regular or irregular rings, the outside of bracelets and annular bodies, lateral surfaces on disc-shaped bodies etc.

The rotary movement-effecting unit can be rotatable about its centre-axis. The unit comprises in this case a movement-transforming element, which is disposed concentrically around the centre-axis. A
5 movement-receiving element on the securing element is applied eccentrically in relation to the said centre-axis, a transmission ratio, depending upon the engraving function and the form and size of the object, existing
10 between the movements-transforming and receiving elements. In a preferred embodiment, the engraving tool extends through the movement-transforming element. In this instance, the securing element supports the object so that the outer-displacing parts of the engraving tool, e.g. the parts supporting an engraving needle, are able
15 to interact with the particular surface of the object which is clamped before the said movement-transforming element/gearwheel.

The engraving tool is preferably arranged such that it is longitudinally displaceable relative to the
20 securing element and a unit which longitudinally displaces the engraving tool comprises, on the one hand, a first ball-screw which is rotatably disposed by means of a first motor, controllable by the said signals, which motor can here be constituted by a first stepping motor,
25 and, on the other hand, a first ball-nut which supports an element supporting an engraving tool. The ball-screw, the ball-nut and a transmission-conveying element between the stepping motor and the first ball-screw are arranged to achieve the said basic play-free functioning.

30 The engraving tool can further be arranged such that it can be lowered, against the action of a counter-holding function/spring function, towards the surface in question of the object which is to be provided with the particular engraving. The lowering capacity is brought
35 about by a lowering movement-effecting unit, which comprises, on the one hand, a second ball-screw, which is rotatably disposed by means of a second motor controllable by the said signals, preferably a second stepping

- 5 -

motor, and, on the other hand, a second ball-nut, which performs the lowering function in respect of the engraving tool. The second ball-screw, the second ball-nut and the transmission between the second stepping motor and
5 the second ball-screw are arranged or selected with essentially play-free functioning.

The second ball-nut is interactable with the engraving tool in a bearing function which allows relative movement, on the one hand, for the longitudinal
10 displacement movement of the first ball-nut, and thereby of the holding element for the engraving tool, on the first ball-screw, and, on the other hand, for the longitudinal displacement movement of the second ball-nut on the second ball-screw, without essentially affecting the
15 lifting and falling movements of the engraving tool relative to the respective object surface or the lowering and raising functions of the engraving tool in relation to the particular object surface.

The securing element can comprise two individually actuatable control jaws, between which irregularly
20 shaped objects can be clamped. The securing element can exhibit bearing elements which are interactable with the outside of the object. In one embodiment, one or more of the bearing elements are rotatably disposed about their
25 respective longitudinal axes. One or more of the said bearing elements can be provided with lateral recesses of varying depth, so that, in the bearing function, adaptation to the irregular external form of an object is achieved, at the same time as the object can be held
30 centred (in a non-lowered position) relative to the engraving tool extending into the centre of the object.

The invention is also characterised by distinctive features which are evident in the following description and in the associated drawings.

ADVANTAGES

As a result of what has been proposed above, it is possible to set up a modular system in which requirements amongst individual users can be met by a choice of modular units. The modular units are formed by a basic machine of structurally simple and well-working construction. The respective user can purchase a basic function with one or more auxiliary functions which can be gradually supplemented. Most types of objects/gold objects can be engraved and the engraving function per se has, in principle, no limits, but rather all types of type style can be used. Stamps and markings can also be imitated and introduced on the object.

DESCRIPTION OF FIGURES

- 15 A currently proposed embodiment of a device which exhibits the significant characteristics of the invention will be described below, simultaneous reference being made to the attached drawings in which:
- 20 Figs. 1-4 show, in various views and cross-sections, a structural basic version of the structurally altered engraving machine which is provided, in this case, with a first type of securing element for objects,
- 25 Figs. 5-6 which (sic) show how securing elements according to Figure 1 function for the securement of an irregular type of annular object (signet- ring),
- Figs. 7-9 show the securement of other types of annular objects,
- 30 Figs. 10-12 show various views of the design of a second version of the securing element
- Fig. 13 shows, in end view, a securing element which is a variant of the securing element according to Figures 10-12, and

- 7 -

Figs. 14-16 show, in various views, a third embodiment of the securing elements.

DETAILED EMBODIMENT

Figures 1, 2, 3 and 4 show the basic construction of the new engraving machine having an associated securing element of a first type. The machine works on three coordinate axes and the movements in the various axes are effected by three units. The first unit is clearly indicated by 1 and comprises a stepping motor 2 of a type which is known per se.

The motor is fixed in a frame part 3. The motor is arranged to drive a rotatable unit 4, which forms part of the first unit and is mounted on guide rollers 5, 6 and 7. The motor 2 rotates the unit 4 via a drive belt 8, the drive wheel of the motor being indicated by 9. The drive belt is arranged such that it can be tensioned, having a tension roller 10 which is displaceable relative to the drive belt in a displacement device 11. The rotatable unit 4 is also provided with a distance 12, on which a securing element of the said first type is disposed. The rotation occurs about the centre-axis 13 of the rotatable element.

Securing elements of the first type comprise chuck jaws 14 of a type which is known per se. The chuck jaws are arranged such that they can be longitudinally displaced towards and away from one another, in a holder 15 having an f-groove. The longitudinal displacement of the jaws is arranged to occur by means of manually actuatable rotary elements 16, 17. This arrangement is known per se and will not here be further described. It should be stated that when the manual elements 16 and 17 are actuated, these can be actuated individually in the directions of the arrows 18 and 19 respectively. The jaws are arranged with bearing elements 20, 21, 22 and 23. The said bearing elements are arranged to interact with an object (not shown in Figures 1-4) which is to be clamped

or secured in the machine. The bearing elements are rotatable, with certain pre-determined inertia, about their respective vertical axes 24. The bearing elements are provided, at those of their parts which are
5 interactable with the object, with a groove 25 of varying depth. The grooved parts of different depth can thus be turned towards the object in question in interaction with it.

The machine is provided with an engraving tool
10 26, which supports an element performing an engraving function, e.g. in the form of an engraving needle 27, at its upper end. The engraving tool 26 extends from the lower or inner parts of the machine up towards the securing element according to the above. The rotatable
15 part 4 and the distance 12 are provided with continuous recesses 28, 29 for the engraving tool. The jaws 16, 17 adopt a position such that the engraving tool is able to extend up between the bearing elements 20, 21, 22 and 23. The bearing elements are arranged, in this case, to
20 support (clamp round) the object so that the upper parts of the engraving tool are placed against the inner surface of the object, i.e. in the case illustrated, it is assumed that the object is constituted by an annular element, the inner surface of which is to be engraved.
25 The object is clamped in the rotatable part by means of the jaw-arrangement having the said associated bearing elements 20-23. In the case illustrated, the engraving tool is arranged such that it can be longitudinally displaced in its longitudinal direction, which essen-
30 tially coincides with the centre-axis 13 of the element 4. During the engraving process, the element 4 is thus rotated together with the clamped object, at the same time as the engraving tool is longitudinally displaced in its longitudinal direction.

35 The longitudinal displacement of the engraving tool 26 is carried out by a unit which comprises a stepping motor 29, a first ball-screw 30, a first ball-nut 31, a holder 32 for the engraving tool, which holder is

- 9 -

fixed in the first ball-nut, and a transmission between the stepping motor 29 and the first ball-screw 30. In this instance, the arrangement is of a known type and characteristic of the arrangement is the fact that an essentially play-free displacement of the holder 32 can occur in the longitudinal direction of the first ball-screw. The engraving tool, which is tightly fastened in the holder 32 in a manner which is known per se, also itself obtains, in this way, an essentially play-free longitudinal displacement. A fundamental aspect of the invention is that the longitudinal displacement of the engraving tool can be performed with such high precision that a very good engraving result is obtained. The engraving tool 26 is also connected to a transmitter element 34, by means of which the position for the longitudinal displacement of the engraving tool can be measured. It is especially important in this regard that the starting position for the longitudinal displacement of the engraving tool can be indicated at the commencement of the respective engraving process. The transmitter element 34 can be constituted by a type which is known per se and can be arranged for the engraving tool in a manner which is known per se and will not therefore here be further described. In Figure 1, the tightening of the holder 32 around the engraving tool is effected by a screw 35 and the holder exhibits, in principle, legs which clamp around the engraving tool. The engraving tool has a pencil-like, long and narrow form.

The engraving tool will also be able to execute a lowering movement or tilting movement which results in the engraving needle 27 coming into physical contact with the object material. This lowering or tilting function occurs against the action of a counter-holding element which, in the present case, has the form of a spring 36. The lowering function is effected by a unit comprising a motor 37, which can also itself have the form of a stepping motor. The motor drives a second ball-screw 38 via a transmission 39. On the ball-screw is disposed a

second ball-nut 40, which is longitudinally displaced, as a function of the rotation of the ball-screw, in the longitudinal direction of the ball-screw, i.e. in principle the same functioning as the ball-screw 30 and its ball-nut 31. The ball-nut is provided with an actuating element (pin) 41, which in principle bears freely against the side of the engraving tool. The element 41 protrudes between two guide pins 42, 43 which are fastened in the engraving tool, e.g. fixed therein by welding, soldering etc. As a result of the arrangement, the ball-nut 40 is fixed in terms of its rotary position, as is the holder 32, without any seize-up tendencies arising in conjunction with the raising and lowering functions of the needle.

The arrangement according to the above is characterised by an essentially play-free raising and lowering function for the engraving tool 26. In addition, the lowering and raising functions of the engraving tool are easily realised in a structurally very simple manner by means of the ball-screw 38 and the ball-nut 40, without the lowering functions being affected.

The said stepping motors 2, 29 and 37 can be constituted by control motors. As an example of useable motors, those motors which appear on the general market under the designation "stepping motor" (e.g. ISEL 1.8° 55 and 110 Ncm having article number 3450) can be cited. The transmitter element can be constituted by the transmitter element which appears on the general market, a reading fork (Sharp GP-ISOI). The motors and the transmitter element are connected in a known manner to a computer installation 44, which can be constituted by a known personal computer, e.g. of the VICTOR 386 make. The connection of the computer installation is realised via an adaptation unit 45, which forms part of the installation (e.g. the computer) in its entirety. The computer installation is also provided with a terminal 45, via which engraving data, type style etc. can be entered in a manner which is known per se. Computer programs for

- 11 -

effecting control signals i1, i2 and i3 as a function of feedback signals i1', i2' and i3' respectively and the transmitter signal ig are known per se and can be supplied with professional adaptations. Inter alia,
5 software for the inventor's own previously known machines can be utilised and adapted. The computer installation and the software will not therefore be described here in detail.

In Figures 5 and 6, an object is shown, indicated
10 by 47. The object comprises, in the present case, a signet-ring which is to be engraved on its inner surface. The signet-ring, from an outward view, has an irregular form, but as a result of the individual actuation facilities of the jaw system 14' and the individually adjustable bearing elements 20', 21', 22' and 23', it is
15 possible to obtain a clamping of the object 47 in which the engraving tool 26' is essentially centred in the ring and an expedient engraving can therefore be performed on the inside 47a of the object by means of the rotary
20 movements of the rotatable unit 4' and the longitudinal displacement and lowering/raising movements of the engraving tool 26'.

Figures 7-9 illustrate the adaptability of the securing element to rings of various types by means of
25 adjustments of the jaw elements and the bearing elements. Figure 7 shows how an engraving of an irregular ring 47' will be able to be performed from its inside 47a'. Figure 8 shows the clamping of a circular ring 47'' and Figure 9 shows the clamping of a circular ring which is crowned
30 on its outside with diamonds 48 or other precious stones.

Figures 10-12 show how flat surfaces on medallions, disc-shaped objects etc. can be achieved using a second type of securing element. In this case, an element
35 50 is disposed in the rotatable unit 4'', which element transforms the rotary movement of the rotatable unit to a receiving element 51. The element 50 has, in the present case, the form of a gearwheel and the element 51 a gear rack. The gear rack is disposed eccentrically in

- 12 -

relation to the axis of rotation 13' of the rotatable unit 4'. The arrangement converts the rotary movement in the unit 4' into a linear movement. The gear rack 51 is disposed on a ruler-shaped part 52, which is guided on
5 rollers or pulleys 53, 54 mounted in the frame of the machine. The pulleys 53, 54 are here arranged such that contact is established between the gearwheel 50 and the gear rack 51. Upon rotation of the gearwheel 50, the ruler is longitudinally displaced in the direction of the
10 arrows 55 on the said rollers 53, 54. The linear movements 55 are coordinated with the above-described longitudinal displacement movements of the engraving element 26'', so that an object 49 applied to the ruler obtains the desired engraving. The jaw arrangement and
15 the distance 12 according to Figures 1-4 have therefore been removed in this case and replaced by the element 50, the element 51 and the sliding elements 53, 54.

The version of the securing element according to Figures 10-12 has been modified in the version according
20 to Figure 13. By utilising a bow-shaped element 56 (in the case illustrated, having the form of an open ring), an object in the form of a signet-ring 57 is clamped next to or in the machine so that engraving can be performed on an essentially or totally flat surface on the outside
25 of the ring. The transmission to the ruler from the rotating unit in the machine is realised in the same way as described above. The bow-shaped element 56 is provided with clamping screws 58 and 59, by means of which the signet-ring 57 can be clamped in place. The signet-ring
30 has, in the present case, oblique conical (surfaces) (sic), with which the ends of the clamping screws 58, 59 are able to interact.

Figures 14-16 show an additional variant of the securing element. The bendable unit 4''' has, in an
35 equivalent manner to the above, a movement-transforming element 50' (gearwheel). The movement-receiving element has, in this case, the form of a second gearwheel 60, so that the rotary movement from the element 50' generates

- 13 -

a rotary movement in 60 which is utilised in the engraving function. The element 60 is mounted in a frame part 61 and actuates, in turn, a holder 62 for an object 63 in the form of a ring, a bracelet etc. which is to be engraved on the outside 63a. The fixture for the object is indicated by a part 64, in which a clamping screw 65 is disposed. This clamping can be carried out in a manner which is known per se using a means which is known per se. Engraving of the outsides 63a of the object can therefore be done simply, on the basis of the specified principles.

In Figure 10, the longitudinal displacement movements of the engraving tool are indicated by 66 and in Figure 12 the rotary movements of the rotatable unit 4' are indicated by 67. In Figure 13, the raising and lowering movements of the engraving tool are indicated by 68.

The securing elements and the machine arrangement can therefore be arranged for engraving both the inside and outside of objects, rings, bracelets etc. The exchangeability of the securing elements and parts therein, e.g. the parts 4, 12, 21-23, 50, 53, 54, 63, 64 etc., are arranged for easy exchangeability and/or supplementation.

The invention is not limited to the embodiment shown by way of example above, but can be subject to modifications within the framework of the subsequent patent claims and the inventive concept.

PATENT CLAIMS

1. Device relating to a computer-controlled engraving machine, in which an object (47) can be fixed in securing elements (56, 58, 59), an engraving tool (269) (sic) and the securing element are arranged to execute mutually relative movements (66, 67) for the realisation of the engraving function and units effecting the said relative movements are controllable from a computer installation (44) into which engraving information is entered or can be entered via a terminal (46) and, by means of which information, control signals (i1, i2, i3) can be generated for controlling the movements-effecting units, plus a relative movements [sic] in the form of a centre-recess, through or in which the engraving tool extends for interaction with the said object (47) fitted in the securing element, characterised in that the rotary movements-effecting unit (4) is provided with or interacts with an element which transforms the rotary movements of the effecting unit (4), e.g. a first gearwheel, the transformed rotary movements of which are transmittable to a receiving element, e.g. a second gearwheel (60) or a gear rack (51) and in that the receiving element realises in turn, on the basis of the said transformed movements, a second movement, e.g. a rotary movement or linear movement (55) for the said securing element (56, 58, 59), which is then capable of holding the object so that an (in relation to the centre-line of the centre-recess) essentially eccentric or straight surface can be attacked by the engraving tool (269) (sic) during the engraving function, the object being able to have the form of a disc (49), bracelet etc., which is to be provided with an engraving on a lateral surface, outside etc.
2. Device according to Patent Claim 1, characterised in that one or more of the movement-effecting units comprises rotating and longitudinally displaceable parts (30, 31), which operate in conjunction and with an

- 15 -

essentially play-free functioning in the respective relative movement between the engraving tool (26) and the securing tool and/or in that the securing element is arranged to receive an irregular object (47) for
5 securement, e.g. a signet-ring which is to be provided with an engraving on the inside.

3. Device according to Patent Claim 1 or 2, characterised in that one and the same machine is arranged for exchangeability or supplementation of the securing ele-
10 ment, so that the machine can be alternatively arranged for engraving the inside of closed or open, regular or irregular rings, the outside of bracelets and annular bodies, lateral surfaces on disc-shaped bodies etc.

4. Device according to Patent Claim 1, 2 or 3,
15 characterised in that the rotary movement-effecting unit (4) is rotatable about its centre-axis (13), in that the transforming element (50) is disposed concentrically around the centre-axis and in that the receiving element (51, 60) is applied or is applicable eccentrically in
20 relation to the centre-axis (13); a transmission ratio, depending upon the engraving function and the form and size of the object, existing between the transforming and receiving elements.

5. Device according to Patent Claim 4, characterised
25 in that the engraving tool extends through the transforming element (50) and in that the securing element supports the object (63) so that the outer-displacing parts of the engraving tool/engraving needle (27) interact with the particular surface of the object placed
30 before the transforming element (50).

6. Device according to any of the preceding patent claims, characterised in that the engraving tool is arranged such that it is longitudinally displaceable relative to the securing element and in that a unit (29,
35 30, 31, 32) which longitudinally displaces the engraving tool comprises, on the one hand, a first ball-screw (30) which is rotatably disposed by means of a first motor, controllable by the said signals (12), preferably a first

stepping motor, and, on the other hand, a first ball-nut (31) which supports an element (32) supporting an engraving tool (26), the ball-screw, the ball-nut and the transmission-conveying element (33) between the stepping
5 motor and the first ball-screw being arranged to achieve the said essentially play-free functioning.

7. Device according to any of the preceding patent claims, characterised in that the engraving tool (26) is arranged such that it can be lowered, against the action
10 of a counter-holding function (36), towards the particular surface of the object which is to be provided with the particular engraving, by means of a lowering movement-effecting unit, which comprises, on the one hand, a second ball-screw (38), which is rotatably disposed by
15 means of a second motor controllable by the said signals (i3), preferably a second stepping motor, and, on the other hand, a second ball-nut (40), which performs the lowering function of the engraving tool, the second ball-screw, the second ball-nut and the transmission (39)
20 between the second motor and the second ball-screw being arranged or selected with essentially play-free functioning.

8. Device according to any of the preceding patent claims, characterised in that the second ball-nut (40) is
25 interactable with the engraving tool in a bearing function which allows relative movements, on the one hand, for longitudinal displacement movements or longitudinal-running movements of the first ball-nut and of the holding element for the engraving tool respectively on or
30 along the first ball-screw, and, on the other hand, for longitudinal displacement movements of the second ball-nut on the second ball-screw, without essentially affecting the lifting and falling movements (66) of the engraving tool relative to the object surface or the
35 lowering and raising functions of the engraving tool in relation to the particular object surface.

9. Device according to any of the preceding patent claims, characterised in that the securing element

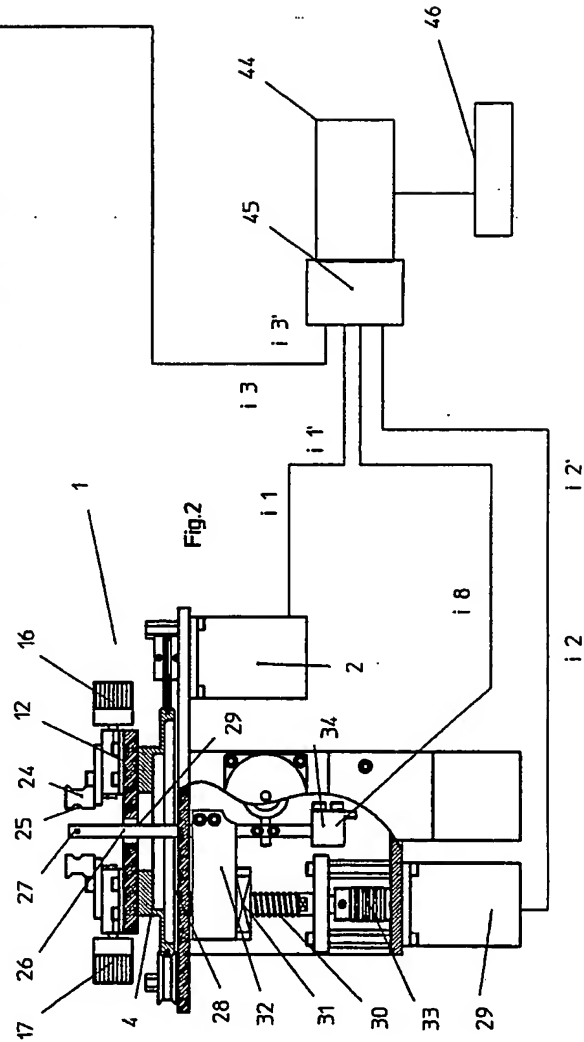
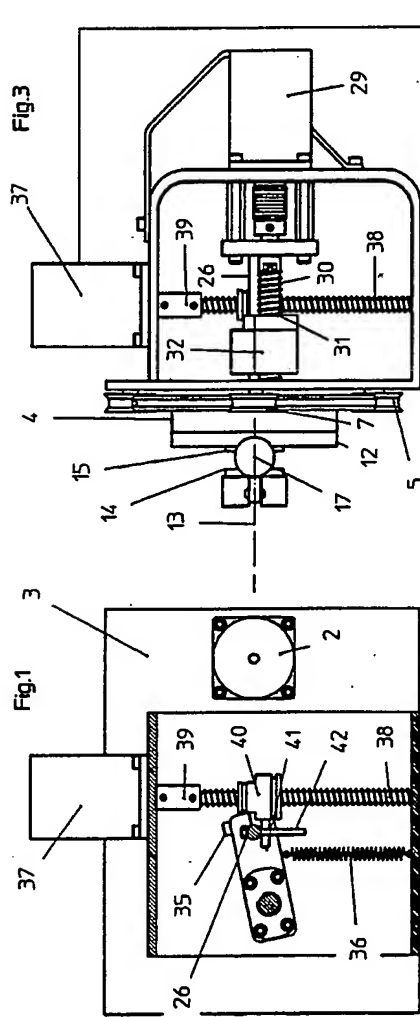
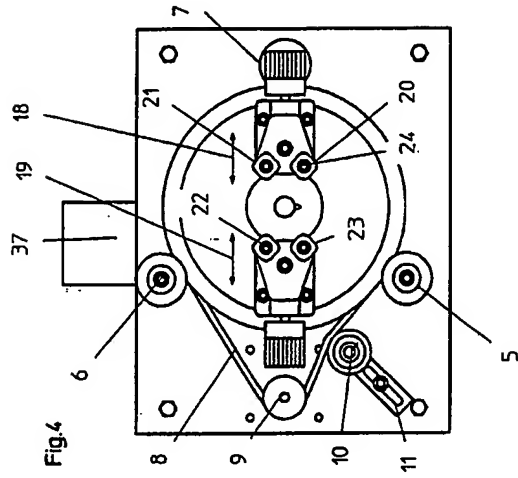
comprises two individually actuatable control jaws (14), between which irregularly shaped objects can be clamped.

10. Device according to any of the preceding patent claims, characterised in that the securing element
5 exhibits bearing elements (20-23) which are interactable with the outside of the object and/or in that one or more of the bearing elements are rotatably disposed about their respective longitudinal axes and in that one or more of the bearing elements are provided with lateral
10 recesses (25) of varying depth along the periphery, in order, in the bearing function, to achieve adaptation to the irregular external form of an object, at the same time as the object can be held centred relative to the engraving tool extending into the centre of the object
15 (in the non-activated state of the engraving tool).

11. Device according to any of the preceding patent claims, characterised in that, for annular objects (47) which are to be engraved on the inside (47a) or on an inner surface, the machine is provided with a first type
20 of securing element, in which a jaw-shaped element (14) or a corresponding clamping element is interactable with the outside of the object and in which the engraving tool (26) extends to the centre of the object, so that its interaction function with the object gains access against
25 or to the respective inner surface of the annular object, in that, for the engraving of an outer surface of the object, the said clamping element is replaced, on the one hand, by an auxiliary fitting comprising drive movement-receiving elements (51, 60), which are actuatable by
30 drive movement-effecting elements, which in turn obtain their movements from the rotary movement-effecting unit (4) of the machine, on the other hand by second securing elements (53, 54 and 64, 65 respectively), which are eccentrically disposed in relation to a centre-axis (13)
35 on the rotary movement-effecting unit, the auxiliary fitting alternatively being provided or being able to be provided, by virtue of exchangeability on the same machine, with elements (51, 60) which are capable of

- 18 -

converting the rotary movement of the rotary movement-effecting unit to another rotary movement, linear movement or combination of the said movements.



SUBSTITUTE SHEET

2 / 6

fig. 6

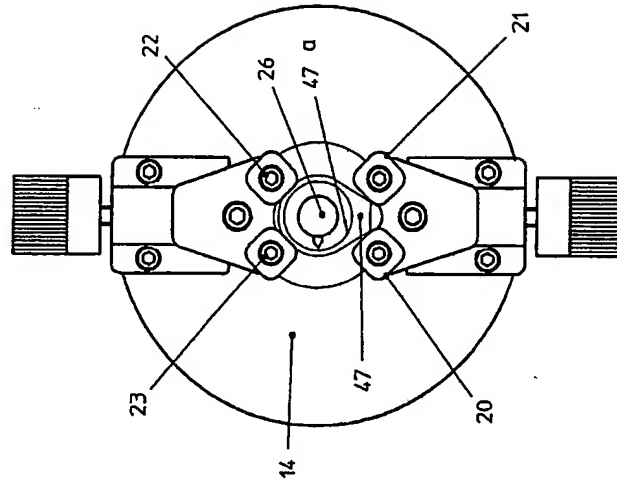
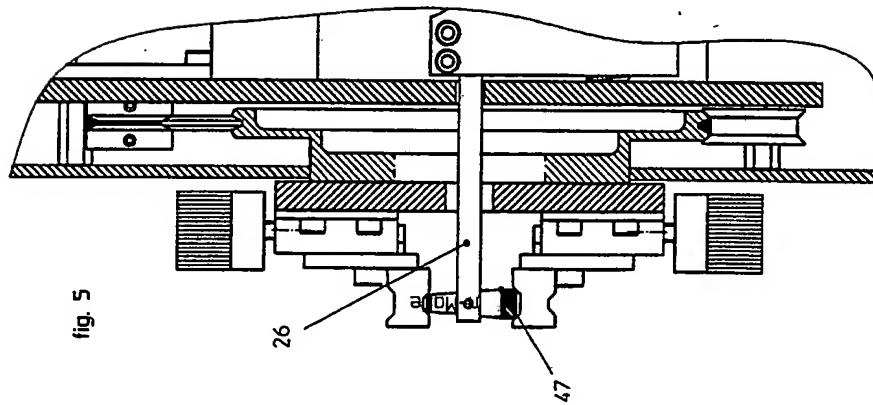
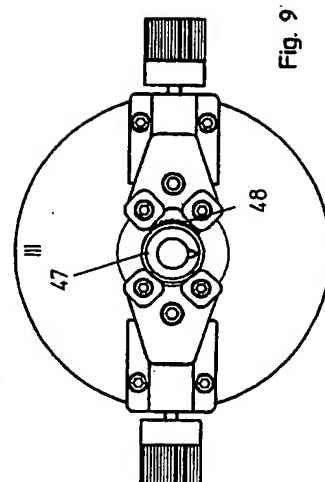
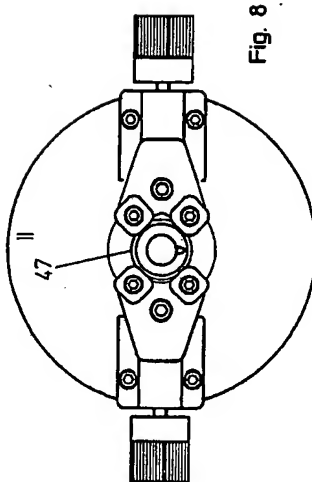
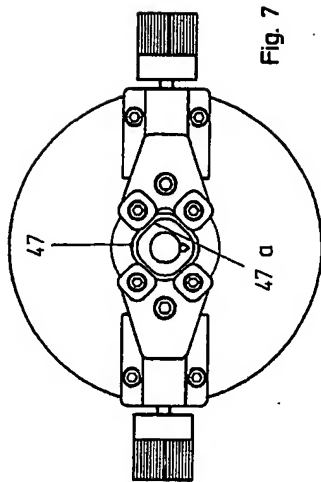


fig. 5



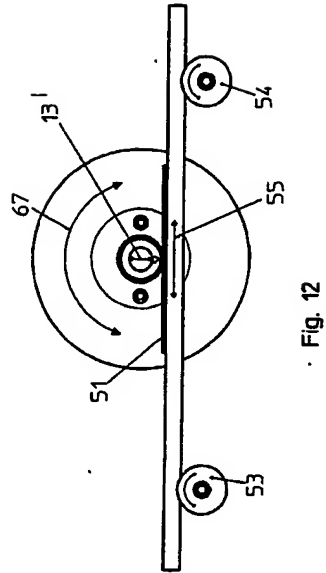
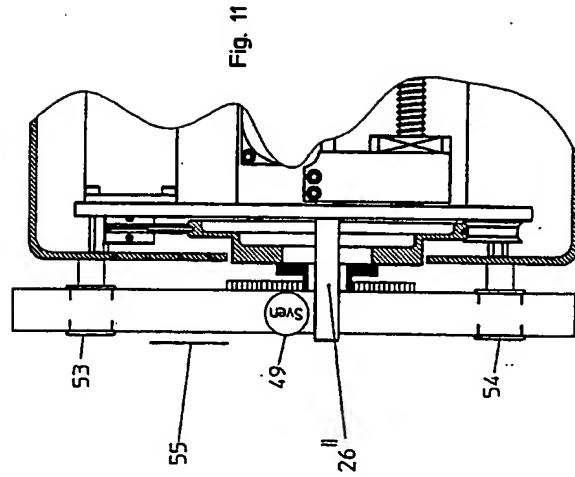
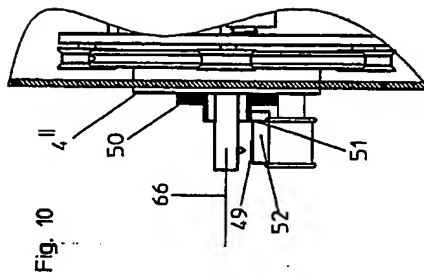
SUBSTITUTE SHEET

3 / 6



SUBSTITUTE SHEET

4 / 6



SUBSTITUTE SHEET

5 / 6

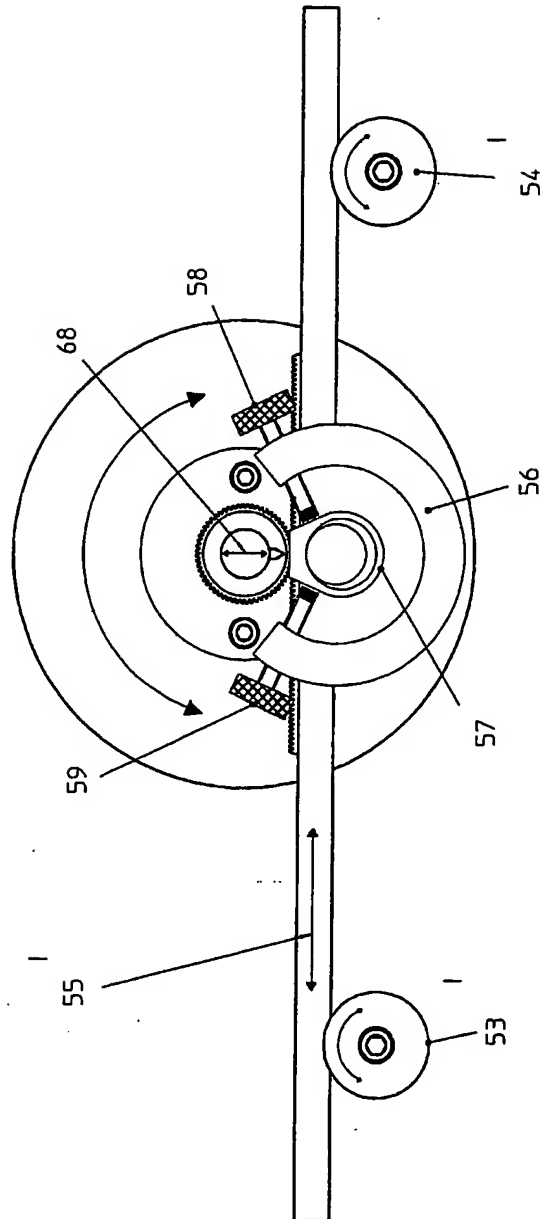


Fig. 13

SUBSTITUTE SHEET

6 / 6

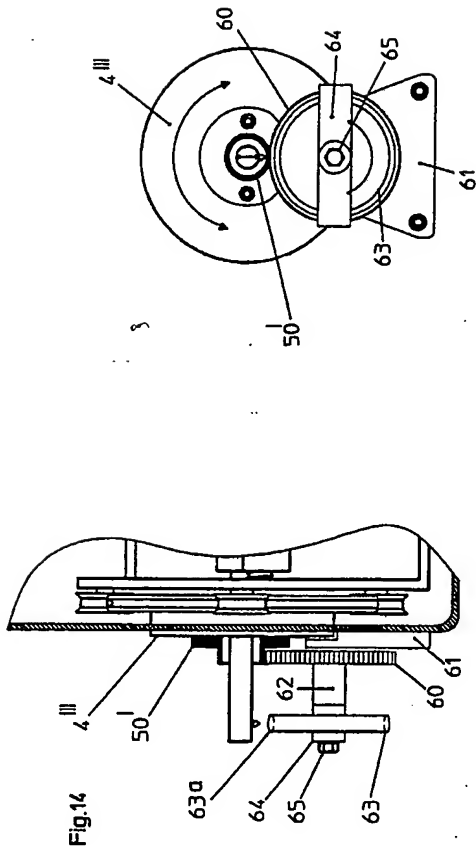
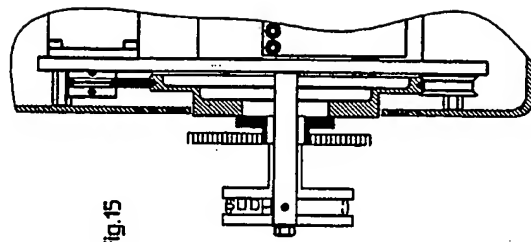


Fig. 16



SUBSTITUTE SHEET

INTERNATIONAL SEARCH REPORT

International Application No PCT/SE 92/00625

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) ⁶ According to International Patent Classification (IPC) or to both National Classification and IPC IPC5: B 44 B 3/00, 04, 06										
II. FIELDS SEARCHED <div style="text-align: center; border-top: 1px solid black; border-bottom: 1px solid black;">Minimum Documentation Searched⁷</div> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%; border-bottom: 1px solid black;">Classification System</td> <td style="border-bottom: 1px solid black;">Classification Symbols</td> </tr> <tr> <td style="height: 40px; vertical-align: bottom;">IPC5</td> <td style="vertical-align: bottom;">B 44 B; B 23 H</td> </tr> </table> <div style="text-align: center; border-top: 1px solid black; border-bottom: 1px solid black;">Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched⁸</div> <p>SE,DK,FI,NO classes as above</p>			Classification System	Classification Symbols	IPC5	B 44 B; B 23 H				
Classification System	Classification Symbols									
IPC5	B 44 B; B 23 H									
III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹ <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 10%; border-bottom: 1px solid black;">Category *</th> <th style="width: 60%; border-bottom: 1px solid black;">Citation of Document,¹¹ with Indication, where appropriate, of the relevant passages¹²</th> <th style="width: 30%; border-bottom: 1px solid black;">Relevant to Claim No.¹³</th> </tr> <tr> <td style="height: 300px; vertical-align: top; border-right: 1px solid black;">A</td> <td style="vertical-align: top;"> WO, A1, 9015723 (AB AUTOENGRAVING) 27 December 1990, see abstract <div style="text-align: center; margin-top: 20px;">-----</div> </td> <td style="vertical-align: top; border-right: 1px solid black; text-align: center;">1</td> </tr> </table>			Category *	Citation of Document, ¹¹ with Indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³	A	WO, A1, 9015723 (AB AUTOENGRAVING) 27 December 1990, see abstract <div style="text-align: center; margin-top: 20px;">-----</div>	1		
Category *	Citation of Document, ¹¹ with Indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³								
A	WO, A1, 9015723 (AB AUTOENGRAVING) 27 December 1990, see abstract <div style="text-align: center; margin-top: 20px;">-----</div>	1								
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>* Special categories of cited documents:¹⁰</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&" document member of the same patent family</p> </div> </div>										
IV. CERTIFICATION <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; border-bottom: 1px solid black;">Date of the Actual Completion of the International Search</td> <td style="width: 50%; border-bottom: 1px solid black;">Date of Mailing of this International Search Report</td> </tr> <tr> <td style="height: 40px; vertical-align: bottom;">14th December 1992</td> <td style="vertical-align: bottom; text-align: center;">22-12-1992</td> </tr> <tr> <td style="border-bottom: 1px solid black;">International Searching Authority</td> <td style="border-bottom: 1px solid black;">Signature of Authorized Officer</td> </tr> <tr> <td style="text-align: center; vertical-align: bottom;"> SWEDISH PATENT OFFICE <small>Form PCT/ISA/210 (second sheet) (January 1985)</small> </td> <td style="text-align: center; vertical-align: bottom;"> Johan von Döbeln </td> </tr> </table>			Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	14th December 1992	22-12-1992	International Searching Authority	Signature of Authorized Officer	SWEDISH PATENT OFFICE <small>Form PCT/ISA/210 (second sheet) (January 1985)</small>	 Johan von Döbeln
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report									
14th December 1992	22-12-1992									
International Searching Authority	Signature of Authorized Officer									
SWEDISH PATENT OFFICE <small>Form PCT/ISA/210 (second sheet) (January 1985)</small>	 Johan von Döbeln									

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO. PCT/SE 92/00625**

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the Swedish Patent Office EDP file on 02/12/92. The Swedish Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO-A1- 9015723	90-12-27	CA-A- 2058773	90-12-16
		EP-A- 0477266	92-04-01
		SE-B-C- 463910	91-02-11
		SE-A- 8902158	90-12-16